Appendix

FISH AND WILDLIFE VALUES ASSOCIATED WITH THE DELTA'S CHANNEL AND LEVEE SYSTEM

The Delta levees provide and protect important wildlife habitat for numerous species of waterfowl and other wildlife. The Delta channels defined by that levee system also support fishery resources of state, national, and international significance. These habitats support:

- 230 species of birds,
- 45 species of mammals,
- 52 species of fish,
- 25 species of reptiles and amphibians,
- 150 species of plants.

Two categories of fish and wildlife habitat are integral to discussions of Delta levees. First, are the habitats associated with the levees themselves and second, those habitats on the island interiors that are protected as a by product of levees. Both categories of habitat contribute to the Delta's fish and wildlife values.

The extent of the marshes, riparian forests and other habitat types in the Delta as it existed before human intervention is not precisely known. However, based on historical accounts and other available data, it is possible to generally characterize the historic condition of the 700,000 acres in the Delta. The heart of the Delta was likely covered primarily by tidal freshwater marsh, crisscrossed by many waterways, including dead-end sloughs. Riparian was only a small component of the habitat composition. Large rivers and streams, entering the outer Delta on the north, east and south created waterways which were bordered by extensive stands of riparian forest growing on naturally deposited alluvial levees. The area also contained upland grasslands and woodlands.

In the Central Valley as a whole, more than 90 percent of the riparian forest is gone. They were cleared historically for firewood, agriculture and levee building. As noted above, the impacts to riparian habitat in the Delta was focused primarily in the outer portions of the Delta. Urban development is causing further losses in the Central Valley as well as the Delta.

HABITATS ASSOCIATED WITH DELTA LEVEES

The habitat types which are associated with levees can be categorized as follows:

- **Shaded Riverine Aquatic (SRA)** - this habitat type includes all vegetation which overhangs the water, regardless of tide stage as well as near shore and in-channel aquatic cover such as submerged logs, roots, etc.

- **Riparian forest** - includes trees greater than twenty feet in height typically with one or more understory layers (cottonwood, alder, sycamore, etc.)

- **Scrub shrub riparian** - includes trees and woody shrubs and vines (alder, willow, wild rose, box elder, wild blackberries) less than twenty feet in height.

- **Freshwater marsh** - includes cattail and tule marshes found along the drainage ditch at the landside levee toe and other areas at the interface of the levee and channel edge, and berms and berm islands.

- **Riverine** - includes vegetated shallow mudflats, shoals, submerged logs, and in water vegetation such as pondweed on the channel side of the levee.

Shaded Riverine Aquatic habitat has been recognized by the U.S. Fish and Wildlife Service (USFWS) National Marine Fisheries Service (NMFS) and Department of Fish and Game (DFG) as one of the most valuable habitat components of the riverine aquatic ecosystem of the Sacramento River system and Delta.

SRA habitat occurs in the nearshore aquatic zone where the adjacent riverbank supports riparian vegetation that either overhangs or protrudes into the water. It usually occurs, and has highest habitat values, along banks which have not been riprapped. However, in instances where woody vegetation has been allowed to recolonize riprapped banks, attributes of SRA habitat can become reestablished.

The productive interaction and synergism of terrestrial and aquatic habitat types associated with SRA result in a valuable cover type for fish and other aquatic organisms, providing a variety of microhabitats, composed of various flows, depths, cover, and food production. Riparian vegetation hanging over the water also shades the aquatic environment. Leaf and insect drop provides food and other essential nutrients to the aquatic ecosystem. Of particular note is the documented value of this natural, nearshore zone to juvenile salmon as they rear in and migrate through the Delta to the ocean.

As defined by the USFWS one or more of the following attributes are present in SRA 1) living roots, branches, and tree trucks exposed within the water; 2) fallen plant material, including logs, branches, and leaves within the water; 3) relatively irregular and uneven natural banks, often with many depressions, cavities, and crevices; 4) comparatively shallow, low-velocity areas near the shoreline; 5) more detritus and greater primary food-chain production than nearby unshaded area; and in certain instances, 6) lower water temperatures than comparable unshaded nearshore areas.

Riparian habitat, both riparian forest and riparian scrub shrub, are found on the water and land side of levees, berms, berm islands, and in the interior of some Delta islands. These habitats range in value from disturbed, sparse, low value habitat of relatively undisturbed, dense, diverse, high value habitat. The highest value riparian habitat has a dense and diverse canopy structure, and abundant leaf and invertebrate biomass. The lower value riparian habitat is frequently moved, disced, or sprayed with herbicides resulting in sparse, low diversity habitat structure. Riparian habitat is used by more vertebrate wildlife than any other Delta habitat type.

Riparian habitat is characterized by tree-dominated woodlands and forest or shrub/brush, made up of deciduous woody species. Dominant species in the overstory include cottonwood, sycamore, valley oak and tree willow, which may reach heights of 100 feet. The understory or shorter species include white alder, shrub willow, elderberry, ash and box alder. Blackberries and wild grape are common ground cover or vines.

Riparian woody species can survive seasonal, but not permanent, flooding. They are found on slightly higher ground of natural levees or other areas of sediment deposition in river floodplains. Riparian habitat is commonly found on the banks of waterways and man-made levees, which are, for the most part, artificially cleared.

Raptors (birds of prey), herons and egrets, and cavity nesting birds seek height, and nest or perch in riparian woodland trees. Riparian vegetation supports an abundant and diverse assemblage of insects in the canopy leaf litter, and tree and shrub bark. These insects are an important food source for fish populations such as the Sacramento splittail.

Freshwater marshes associated with levees in the Delta are both tidal and non-tidal. Tidal marshes, once the most widespread habitat in the Delta, are now restricted to remnant patches. "Tule islands" or "berm islands", and "berms" are principally found in Delta channels where the area between levees is wide enough or where substrates are deposited high enough for tules and cattails to survive. There are also remnant non-tidal marshes found in the interior of Delta Islands along toe drain ditches or in close association with seeps at the base of levees.

HABITATS ON LAND PROTECTED BY DELTA LEVEES

The habitat types which are associated with the lands protected by the Delta levees can also be categorized into five types as described below:

- Agricultural
- Lakes and ponds
- Uplands
- Freshwater marshes
- Riparian

Agricultural lands in the Delta region include row crops, pasture, fallow lands and some orchards and vineyards. The present-day Delta is mostly farmlands, which comprise over 86 percent of the dry land surface area. The wildlife habitat value of these lands depends on crop types and the agricultural practices employed including flooding and tillage regimes.

The farmed wetlands of the Delta are critically important habitat for wintering waterbirds including shorebirds, geese, swans, ducks and sandhill cranes, supporting 10 percent of all waterfowl wintering in the state. During the winter, many fields are flooded with shallow water, enhancing their value to ducks, geese, and swans. The Delta farm acreage in corn has particularly good forage value for geese, swans, and cranes.

Agricultural fields also have populations of small animals such as rodents, reptiles and amphibians providing opportunities for raptor foraging. Non-flooded fields and pastures are also habitat for pheasants, quail, and doves.

The Delta and its agricultural lands protected by its extensive levee system, is an internationally significant wintering ground for waterfowl because of the remaining wetlands and shallowly flooded agriculture ground. The Delta is critical to four species of waterfowl, tundra swan, white-fronted goose, northern pintail, and canvasback. The Delta is the single most important wintering area in the Pacific Flyway for tundra swans and ranks second only to Chesapeake Bay in the entire continent. Estimates of the number of swans wintering in the Delta range from 30,000 to 38,000 annually, representing 32-40 percent of the Pacific Flyway population winters. Between 22,000 to 45,000 white-fronted geese winter in the Delta, composing about one-third of the flyway population. Of the white-fronted geese banded on the Yukon - Kuskokwim Delta in Alaska, approximately 17 percent winter in the Delta. Northern pintails are the most numerous waterfowl species found in the Delta.

Estimates of wintering populations, including the Suisun Marsh, vary from 200,000 to 1.4 million birds. State aerial inventories in the early 1950's counted some one million pintails on Staten Island alone. Almost 500,000 pintails, were counted in the Yolo Bypass in January 1973. Canvasback numbers in the Delta vary greatly, but approximately 10 percent of the flyway population can be found there. Although mallards are usually the second most

numerous duck species in the Delta, the midwinter flyway survey indicates that mallards are, on average, only one-tenth as numerous as pintails.

The northeast portion of the Delta is also one of the most important wintering grounds for the Central Valley population of the State listed threatened greater sandhill crane. In winter 1983-84, 53 percent of the population was in the Delta in December, and January, 76 percent of the population was on Staten Island, the DFG's Woodbridge Ecological Reserve, and the Cosumnes River areas. Islands throughout the Delta serve as important foraging areas with crane use primarily focusing on harvested corn fields.

The Swainson's hawk, a state threatened raptor species, breeds and winters in the Delta. Preferred habitat consists of tall trees for nesting and perching in proximity to open agricultural fields which support small rodents and insects for prey. Both pasture land and alfalfa fields support abundant rodent populations. One of the highest breeding densities of Swainson's hawks in the Central Valley is found in the region between Sacramento and Stockton, encompassing the eastern Delta.

Lakes and ponds such as Stone Lake near Sacramento and the "blow out" ponds on islands and tracts such as Venice Island and Webb Tract support simple invertebrate communities, riparian vegetation, and large numbers of waterfowl.

Upland habitats are found mainly on the edge of the Delta and consist primarily of grasslands with some remnants of oak woodland and savannah (grassland with scattered trees).